Infection Control Guidelines for Health Care Workers Caring for Patients with Methicillin-resistant *Staphylococcus aureus* (MRSA) or Vancomycin-resistant Enterococci (VRE)

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INTRODUCTION

Purpose

This infection control guideline on methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE) is intended as a quick reference for patient care workers in various settings including hospitals, nursing homes, and home care. Some of the recommendations may not apply to all settings. This guideline also supplements recommendations published by the Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee (HICPAC) for managing VRE colonized or infected patients. For further reading, consult the references listed (1). Definitions of the terms used in this document (including standard and transmission-based precautions) can be found on page 26.

Background

All health care facilities and home care agencies have either already encountered or will encounter patients colonized or infected with antibiotic resistant bacteria. MRSA and VRE are two such bacteria that may be carried by patients in long-term or acute care facilities. Many people normally carry enterococci in intestinal tracts and staphylococci in their nares or on their skin, and occasionally these organisms become resistant to many of the antibiotics that are used to treat people when infections occur.

Health care workers caring for patients with MRSA or VRE are not themselves at risk for infection. However, they could play a role in transmitting these organisms to other patients if proper hand washing or standard infection control practices are not followed.

This document addresses infection control strategies, and briefly covers recommendations for surveillance, antibiotic utilization, and other aspects of an institutional plan for MRSA and VRE prevention and control.

This protocol attempts to answer the following questions:

- What is the difference between colonization and infection?
- Should personnel be screened for carriage?
- If carriers are found, how are they treated?
- What precautions should be taken in a hospital or nursing home setting when a patient is colonized or infected with MRSA or VRE?
- When can patients with MRSA or VRE colonization/infection be transferred from one facility to another?
- How should the microbiology laboratory be involved?
- What are MRSA- or VRE-related outbreaks and how are they controlled?

EPIDEMIOLOGY OF MRSA AND VRE

Staphylococcus aureus

In the 1950s, *S. aureus* became an important nosocomial pathogen through the identification of the link between carriage in the nasopharynx of hospital employees and wound contamination in patients. Hospital personnel and hospital patients were identified as reservoirs. During this period increasing mortality from penicillin-resistant *S. aureus* wound and surgical infections was noted resulting from cross-contamination by healthy hospital carriers or other patients with sepsis. Due to such infections, hospitals began instituting formal infection control procedures (2). Following this era, semi-synthetic penicillins were developed which were effective in treating S. aureus infections. Broad use of these drugs, however, led to the development and recognition in the 1960s of methicillin-resistant *S. aureus* (MRSA). MRSA strains are, by definition, resistant to the semi-synthetic penicillins such as oxacillin, cloxacillin, dicloxacillin, and other beta lactam semisynthetics.

S. aureus is a gram-positive, cluster-forming coccus, which tests coagulase positive (3). It grows under both aerobic and anaerobic conditions, and is found on human skin and mucous membranes. *S. aureus* can cause a range of infections from skin (cellulitis, boils, impetigo and wound infections) to systemic infections such as bacteremia, endocarditis, and toxic shock syndrome. Therefore *S. aureus* can be found in a variety of body fluids such as urine, wound exudate, and blood.

Transmission is usually by direct skin-to-skin contact and is generally accepted as its most common means of spread. Therefore, hand washing is of primary importance in preventing its spread. Reservoirs during outbreaks may be: 1) any patient with a positive culture, or 2) health care workers who may be transiently colonized. In outbreaks traced to personnel with positive nasal cultures, the affected individuals have had additional risk factors such as dermatitis or recurrent staphylococcal infections themselves (4). Airborne transmission has been suspected in MRSA-outbreaks in burn units. In those situations, contaminated surfaces may be a mode of transmission.

Between 1975 and 1991, data from the National Nosocomial Infections Surveillance (NNIS) system indicate that the percentage of *Staphylococcus* isolates resistant to penicillin rose from 2.4% to 29% (5). Sporadic cases of MRSA were seen in the 1960's, and the first major outbreak occurred in the 1980's. While the problem initially was limited to referral hospitals associated with medical schools, today American hospitals and nursing homes of all sizes have had experience with MRSA.

MRSA is considered to be a severe problem because it spreads easily and treatment can be expensive and difficult. MRSA infections are *not more* virulent than methicillin-susceptible *S. aureus* infections, but can be very virulent in patients who are already acutely ill or debilitated (6). Many patients remain colonized after treatment and can be reinfected or infect others.

MRSA should not be confused with Methicillin-Resistant *Staphylococcus epidermis* (MRSE). *S. epidermis* is an organism which is also part of the normal skin flora and is referred to as “coagulase negative Staphylococci”. *S. epidermis* may be pathogenic, especially in neonate

or implanted prosthetic device situations. MRSE is usually nosocomially acquired, probably by direct hand-to-hand contact, but does not seem to colonize mucous membranes as readily as does MRSA.

Vancomycin-resistant enterococci

Enterococci can be found in stools of more than 90% of healthy people. *Enterococcus faecalis* and *Enterococcus faecium* are most common. While the Enterococci are generally poor pathogens, they can cause invasive disease in medically compromised patients. Multiple resistant strains have also been associated with hospital outbreaks where the organism has colonized the bowels of asymptomatic patients and are transferred on the hands of health care workers to other patients.

The first reports of vancomycin-resistance appeared in 1988 in London. Sporadic cases were noted in the United States, but the first outbreak occurred in a New York hospital in 1989. Nationally, between 1989 - 1993, the prevalence of VRE isolates increased from 0.3% to 7.9% of nosocomial enterococcal infections reported to the CDC (1). During this period, a 34-fold increase occurred in the percentage of VRE infections in patients in intensive care units. In more recent outbreaks, patients have usually been on renal, pediatric, oncologic, intensive care, or other special units with high usage of glycopeptides. Most isolates represent colonization or minor infection, but invasive infections associated with death can occur.

Although VRE is not especially virulent, the lack of effective therapy for invasive infection and the potential for transfer of vancomycin resistance to other bacteria (i.e., *S. aureus*) has made the control of VRE a public health concern. In the next few years, a number of health care facilities and agencies can expect to encounter VRE in their patient population. Although a health care facility or agency may not have had a recognized case of VRE, this organism may be present in the patient population as patients can be colonized with VRE and remain undetected. While VRE is not a threat to health care workers, health care workers can transiently carry this organism and transmit it to other patients.

Recent reports of VRE outbreaks have indicated that patient-to-patient transmission can occur through contact via either a) the hands of health care personnel or b) contaminated patient-care equipment or environmental surfaces (7,8). Because VRE in the gastrointestinal tract does not cause symptoms, VRE is not usually detected unless it is transmitted to other sites where it can cause symptoms (e.g., urinary tract infections, wounds or bacteremias). Preventing and controlling transmission of VRE requires efforts from multiple individuals and can be achieved by addressing: 1) prudent vancomycin use by clinicians; 2) education of hospital or long-term care staff regarding the problem of vancomycin resistance; 3) early detection and prompt reporting (see page 22) of vancomycin resistance in enterococci and other gram-positive organisms; and 4) implementation of infection control procedures to prevent person-to-person transmission of VRE.

Methods to prevent and control transmission of VRE are even more important in the light of recent reports of infections caused by MRSA strains with reduced susceptibility to vancomycin (minimum inhibitory concentration [MIC] ≥ 8 μg/mL) (9). Until the identification of these isolates, MRSA had been susceptible to vancomycin. Although these MRSA isolates did not

exhibit the enterococci genes (vanA or vanB) which confer vancomycin resistance, transfer of the vanA genes experimentally from enterococci to *S. aureus* has occurred (10). Such resistance would pose serious clinical and public health consequences because no currently licensed alternative to vancomycin is available to treat serious MRSA infections.

GENERAL PRINCIPLES

Admission and Transfer of Patients with MRSA or VRE

The admission or transfer of patients should not be affected by MRSA/VRE infection or colonization. All health care facilities, rehabilitative units or facilities, and home care agencies must be prepared to implement appropriate infection control measures for patients infected or colonized with MRSA, VRE and other resistant organisms. It is inappropriate to refuse admission of a patient based solely on the fact that MRSA or VRE are present. Such action negatively affects patients by limiting access to the desired level of care, and unnecessarily extends hospital stay beyond the period of medical care needed.

Today's health care environment must be viewed as a continuum where patients move back and forth across levels of care according to need. Open communication and sharing of information is essential to the provision of quality care. The infection control office in a receiving facility should be notified when a patient with MRSA or VRE is being considered for admission or transfer so that preparations can be made, including reinforcing staff education on the control of these agents.

Principles of Controlling MRSA and VRE Transmission

Strategies for controlling MRSA or VRE transmission are essentially: confine the organism and control the vehicles of transmission that contribute to spread. The most important elements in controlling MRSA or VRE transmission are scrupulous hand washing with appropriate use of barrier precautions, and, for VRE, careful attention to environmental sanitation. For VRE in particular, health care workers should always treat stool and urine as if they contain potential pathogens. Beyond this, control measures will be dictated by the type of facility in which care is provided and the vulnerability of its patient population. Patients vary in their susceptibility to colonization with resistant organisms. For example, high-risk individuals include those who have been on previous antimicrobial therapy, have severe underlying disease, are immunosuppressed, or have been hospitalized in high risk units (e.g., MRSA:burn units, ICUs; VRE:ICUs, dialysis units). Therefore, some patients or residents may have a higher risk of MRSA or VRE infections. Recommendations for control of MRSA and VRE consider these variations in risk. The guidelines also consider differences in purpose between types of health care facilities. Therefore hospital guidelines are more restrictive than those for other health care settings. Because VRE may be transmitted by contact with contaminated surfaces, attention must also be focused on recognizing where the patient or health-care worker may have environmental contacts which could result in transmission.

Factors that should routinely be considered when making decisions about infection control measures and room assignments include:

- intensity of care needs and degree of anticipated contact with excretions, secretions or wound drainage;
- the patient's ability to control secretions and excretions;

- the patient's level of activity and mobility, including expected interaction with other patients in a facility;
- presence of other patients who are infected or colonized with MRSA or VRE;
- potential risk to roommates; and
- room availability.

Patient Placement and Transfer Between Facilities

Patients colonized with MRSA or VRE must not be excluded from placement in other health care facilities on the basis of their bacteriologic status alone. Such discrimination is not only inappropriate but results in prolonged hospital stay. When discharging patients, the discharging facility should inform the receiving facility of the patient's status so that appropriate isolation precautions can be arranged and implemented. Before placing the patient, infection control personnel at the receiving facility should review appropriate precautions (see below) with health care workers who will be providing direct care. The options for placement of a colonized/infected patient include:

Private rooms

- In hospitals, patients colonized or infected with VRE should be placed in a private room or cohorted. For MRSA colonized or infected patients, the facility must determine if the organism is of clinical or epidemiologic importance. If so, a private room is recommended. In facilities that choose to apply standard precautions for most MRSA-colonized or infected patients, facilities should consider placing some patients, such as those with an MRSA respiratory infection or a large MRSA-infected wound/burn, in a private room.
- In long term care facilities, where private rooms may be more difficult to obtain, residents colonized or infected with MRSA should be placed in a private room if they have a generalized, chronic skin condition (e.g., eczema), a MRSA-respiratory infection, a large burn or pressure ulcer that cannot be contained, or they are unable or unwilling to practice good hygiene. Residents colonized or infected with VRE who are incontinent, or who are unwilling or unable to comply with handwashing and hygiene requirements, should be placed in a private room or cohorted.

Cohorting

- Room with another patient/resident colonized or infected with the same organism (cohort). In hospitals or long term care facilities with continued VRE or MRSA transmission, despite implementation of infection control measures, cohort patient care workers as well. (Some hospitals routinely cohort staff to care for VRE-positive patients whether or not there is evidence of transmission.)

Other measures

- Room with a patient who is not immunocompromised and does not have open wounds or indwelling lines (i.e., Foley catheter, I.V., g-tube) in place. Examples of immunocompromised patients include those on chemotherapy or radiation, high dose steroids, HIV infection, or organ or bone marrow transplant patients.

The following recommendations are distinguished by the type of health care setting to which they apply. However, each facility or agency will need to adapt these guidelines on a case-by-case basis according to the situation and their previous experience with MRSA or VRE.

HOSPITAL GUIDELINES

These guidelines summarize the isolation precaution section of the HICPAC guidelines on VRE, other references on MRSA, and the isolation precaution guidelines in Appendix B.

The degree of precaution used to care for MRSA-positive patients will depend on decisions made by the hospital infection control committee regarding the clinical or epidemiologic importance of the organism and the risk of transmission. For instance, differences in precautions between routine admission to the hospital, and patients admitted to critical care units are based on compromised health status of the patients, the intensive contact by personnel, and the close proximity to other very ill or debilitated patients.

MRSA- or VRE-positive (colonized or infected) patients

1. Room Selection

   a. If MRSA is judged by a hospital's infection control program to be of special clinical or epidemiological importance, then contact precautions, including a private room, should be considered. In many cases, depending on the patient and the facility, standard precautions should control the spread of MRSA. Private or isolation rooms are preferred for VRE-positive patients in hospitals.

   b. If other known MRSA- or VRE-positive patients are in the facility, and their placement as roommates is otherwise appropriate, then cohorting is an option to placement in a private room.

   c. If a private room or cohorting is not an option, MRSA or VRE patients may be placed in multiple-bed rooms.[1] However, roommates should not be immunocompromised or have open wounds, multiple lines, or highly invasive equipment (i.e., central or arterial line, respirator, wound suction).

2. Hand washing.

   If standard precautions are used for MRSA control, a simple 10- to 15-second handwash with soap and water suffices. If a facility has chosen contact precautions for the MRSA-positive patient, then antimicrobial soap should be used. Just touching the skin does not require handwashing, but handwashing is required before and after touching wounds and secretions.

   Guidelines for handwashing are stricter for VRE-postive than for MRSA-positive individuals. When caring for VRE-positive patients, it is recommended that an

[1] In facilities where MRSA is highly endemic (i.e., not on special units and the infectious agent is constantly present), patients colonized with MRSA and admitted into routine care units do not need specific precautions as long as standard precautions are followed (2).

antimicrobial agent be used in areas where VRE patients receive care ("bland" soap is not as effective in removing transient carriage). The need for strict compliance with hand washing recommendations should be frequently reinforced. Hands should be carefully washed after any contact with the patient or contact with articles or equipment used in the care of patient and after removal of gloves and other barriers. In addition, after washing hands and when leaving the room where a VRE-positive patient is assigned, open the doorknob with a paper towel and dispose of it after use.

3. Gloves.

   Where patients are in private rooms or cohorted, gloves should be donned when entering the room and removed prior to leaving. Where patients are in multiple-bed rooms, gloves should be worn for all interactions with the MRSA and VRE-positive patients. Gloves must be changed and hands washed between patients. Handwashing is recommended even if gloves are worn because gloves can be perforated and bacteria can grow rapidly. In addition, skin contamination is possible while taking the gloves off. Remove gloves before leaving the patient's room and wash hands immediately.

4. Gowns.

   If there is likely to be substantial contact with the patient or the environment where the patient sleeps, or the patient is incontinent, has diarrhea, uncontained drainage, a colostomy or ileostomy, gowns should be worn. Remove the gown before leaving the patient's environment. If contact precautions were instituted, gowns should be put on upon entering the room.

5. Face protection (masks and eye protection).

   Face protection is worn by hospital personnel during patient care activities that are likely to generate splashes and sprays of blood, body fluids, secretions or excretions to protect mucous membranes from contact transmission. Droplet precautions (e.g., masking before entering the room or working within 3 feet of the patient) is recommended for certain patients, such as those with MRSA-pneumonia.

6. Dedicated equipment.

   Several epidemiological studies have shown that fomites may have a role in VRE transmission. Thus for VRE-positive patients, when possible, dedicate the use of noncritical equipment and items such as stethoscope, sphygmomanometer, bedside commode, or electronic rectal thermometer to a single patient. Although fomites have not been shown to play a significant role in the transmission of MRSA, non-critical equipment used to care for these patients should also be dedicated to an individual patient if contact precautions are instituted (11).[2] Reusable equipment must be appropriately cleaned and

[2] In hospitals where MRSA or VRE are endemic, this may not be practical. In such cases decisions need to be made on a case-by-case basis.

processed before using in the care of another patient, and single-use items need to be properly discarded.

7. Signs.

   An isolation sign in keeping with the system currently used by the institution should be placed on the door or at the bedside to alert staff and visitors to the need for appropriate precautions.

8. Housekeeping and laundry.

   For routine control of MRSA, standard housekeeping and laundry practices appear to be sufficient (2, Appendix B). Stricter standards may be required on special units, such as burn units, where environmental reservoirs may be much more important in transmission.

   Members of the custodial staff have an important role in controlling VRE transmission. They should be educated about VRE and taught to clean and disinfect surfaces in the immediate vicinity of the patient, i.e., bed rails, door knobs, sinks, toilets, etc. (This does not apply to areas where the patients may be temporarily present , such as a lounge or waiting area). Cleaning of these surfaces should be performed daily and cleaning materials changed after use in that room. If patient care equipment is cleaned and disinfected by persons other than housekeeping staff, they too should be educated. Equipment that is typically cleaned only when the patient is discharged, (i.e., IV poles, pumps), should be placed on a schedule for routine cleaning. No specific cleaning interval is currently recommended, and facilities should establish a schedule based on frequency of use, intensity of contact, and other factors that may be relevant to the situation. In most settings, it will not be necessary to modify linen and laundry handling practices as long as all such materials are treated as contaminated. However, personnel who are involved with stripping beds or who otherwise have direct contact with these materials should wear gloves and gowns.

9. Discontinuation of Isolation Precautions.

   MRSA-positive patients

   The infection control practitioner or physician can determine when isolation precautions can be discontinued (i.e., when the risk of transmission is low.) Depending on the site of infection, some clinical signs that may indicate reduced risk of transmission include decreased wound drainage which can be contained or decreased respiratory secretions.

   VRE-positive patients

   Criteria for discontinuing isolation for VRE-positive patients have not been clearly defined. Development of such criteria are confounded by the fact that:

   1) enterococci are expected bowel flora,

   2) VRE may persist indefinitely and be shed intermittently,

   3) measures to eradicate VRE carriage are not currently known,

4) screening cultures may not reliably indicate the presence or absence of VRE,

5) cultures are expensive and may not be cost effective in this instance, and

6) many patients will be discharged or expire before precautions are discontinued.

For patients who remain in the hospital, since VRE colonization can persist indefinitely, stringent criteria may be appropriate. The Centers for Disease Control and Prevention recommends that patients have VRE-negative results on at least three consecutive occasions ($\geq$ 1 week apart) for all cultures from multiple body sites before they are released from isolation.

Variations in the prevalence of MRSA and VRE make it difficult to issue a recommendation that fits all settings. Patients who ever have had a positive culture for MRSA or VRE should be considered at high-risk for colonization. Modification of precautions should be decided on the basis of risk factors for transmission, as outlined at the beginning of this guideline, and not on the basis of culture results alone.

Upon discontinuation of isolation precautions, good handwashing and hygiene instructions should be given to patients. Patients with a history of MRSA or VRE colonization or infection should be identified and their charts flagged to alert clinical and clerical personnel in the event of readmission and placed on precautions commensurate with the risk of transmission.

LONG TERM CARE GUIDELINES

In the past, detection of MRSA was mostly associated with exposure to hospitals. Today, increasing importance is being attached to long term care facilities as reservoirs of infection (12). In addition, as VRE is becoming more common among hospitalized patients, good communication among transferring facilities is essential so that the appropriate level of precaution can be determined.

MRSA- or VRE-positive (colonized or infected) residents

1. Room/roommate selection.

   Resident placement decisions need to consider the risk/benefit and degree of disruption from changes in room assignment (considering all residents affected by a decision), the fact that colonization can persist indefinitely, and the resident's level of interaction within the facility. Decisions will have to be made on a case-by-case basis. For example, residents who are incontinent of stool or urine (VRE), have wound drainage (MRSA or VRE), or respiratory secretions (MRSA) are at greatest risk for being a source of cross-contamination.

   Currently, KDHE recommends a private room for an MRSA-positive patient who has one of the following conditions: a generalized, chronic skin condition (e.g., eczema), a large MRSA-infected burn or pressure ulcer, a MRSA lower respiratory tract infection (tracheobronchitis or pneumonia), or is a resident who is unable or unwilling to practice good hygiene.

   When placing residents with MRSA or VRE in multiple-bed rooms, roommates should not be severely immunocompromised, have indwelling lines, Foley catheters, or open wounds. VRE-positive residents who are incontinent of stool or urine and are likely to significantly contaminate the environment, should be placed in a private room or cohorted with other VRE-positive residents, whenever possible.

2. Activity modifications.

   A long-term care facility is generally considered a resident's home. Residents with MRSA or VRE should be allowed to ambulate, socialize normally, and participate in group activities as long as contaminated body substances are contained. Where appropriate, enhanced barrier protection to contain a contaminated body substance is preferred over restriction of the patient.

3. Hand washing.

   Use of standard soap (MRSA) or an antimicrobial agent (MRSA or VRE) for handwashing in the resident's room is recommended.[3] If a facility's infection control personnel have determined that contact precautions for an MRSA-positive resident are needed, then an antimicrobial soap is recommended. Health-care personnel should wash their hands for at least 10 to 15 seconds with soap and running water before performing invasive procedures or touching wounds. Hands should be carefully washed after **all** patient care activities. Handwashing should also be done between care for different anatomical sites. Hands do not need to be washed routinely after casual contacts, such as a handshake or hug. The need for strict compliance with hand washing recommendations should be frequently reinforced. Where resident compliance is feasible, residents should also receive instructions on hand washing and frequent reinforcement. If residents cannot wash their hands, staff should help them wash their hands after toileting and before leaving their room.

4. Gloves and Gowns.

   In long term care settings there is a need for greater flexibility than in hospitals regarding decisions about the use of gloves and gowns. This will depend in part on the level of resident mobility and general compliance with hygienic practices, and the ability to contain secretions, excretions or drainage. Residents who are bedridden require a greater intensity of care and guidelines described above for hospitals may need to apply. When residents are more socially interactive and ambulatory, the need for gloves or gowns is limited to those situations involving direct contact with the contaminated body site, or potentially contaminated items such as bedding. Nursing and medical staff should determine the most effective application of barrier precautions, balancing the need for infection control with promoting an optimal lifestyle for the patient. In all cases, clear guidance, consistency in approach, and rigorous enforcement is necessary. (*Note: Even if gloves are worn, hand washing after glove removal is also recommended because gloves can be perforated and bacteria can grow rapidly. In addition, skin contamination is possible when removing gloves. Do not wear gloves for prolonged periods or use more than one resident.*)

5. Face protection (masks or eye ware).

   Health care workers should wear masks and eye protection to protect mucous membranes of the eyes, nose and mouth during procedures or patient-care activities that are likely to generate splashed or sprays of blood, body fluids, secretions, and excretions. For VRE-positive patients, the same guidelines for hospitals apply (see page 10).

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[3]Antimicrobial agents are usually available in liquid form and are often referred to as "health-care personnel handwashes" and include active ingredients such as CHG, 2-4%; Triclosan, 0.3-0.5%.

6. Dedicated equipment.

   The need for dedicated equipment is less critical in long term care settings than in hospitals and not routinely recommended. However, residents should be evaluated on a case-by-case basis to determine whether dedicated equipment, such as rectal thermometers, may be indicated. Residents who require a commode and who cannot be relied on to prevent contamination should have such equipment assigned.

7. Signs.

   Notification of isolation should be consistent with the system currently in use in the facility.

8. Housekeeping and laundry.

   For MRSA, soiled linens should be handled with gloves, bagged in the resident's room, and taken directly to the laundry area. Routine cleaning of surfaces near the resident should be done daily to reduce bacterial load. Cleaning should be done with a disinfectant registered with the U.S. Envirnomental Protection Agency as a Hospital Grade Disinfectant. Tubs and whirlpool baths should be cleaned and disinfected (using an EPA-registered disinfectant) after each use.

   For VRE, see hospital guidelines.

9. Discontinuation of Isolation Precautions.

   If a facility has decided to isolate MRSA-positive residents, based on indications such as those outlined on page 13, infection control personnel need to determine when the risk of transmission is reduced to the degree that isolation precautions can be discontinued. Some clinical signs may be decreased wound drainage which can be contained or decreased respiratory secretions. Depending on risk of transmission to others (e.g., the body site(s) affected, the severity of infection), facilities may determine to discontinue isolation precautions for MRSA-positive residents only after there are two negative cultures taken at least one week apart and no sooner than 48 hours after discontinuation of antibiotic therapy. (13)

   VRE colonization may persist indefinitely, so balancing isolation precautions and other resident activities needs to be weighed. For residents who may significantly contaminate the environment (e.g., incontinent of urine or feces), facilities may choose to apply the most stringent precautions by requiring VRE-negative results on at least three consecutive occasions ($\geq$ 1 week apart) for all cultures from multiple body sites.

   Because individuals with MRSA or VRE can carry these organisms indeterminently, long-term care facilities should not require patients to have negative cultures for MRSA or VRE before accepting them.

HOME HEALTH CARE GUIDELINES

Admission and transfer of patients with MRSA or VRE to or from the home is not a concern, other than to alert the receiving facility or agency. In addition, there is no need to disrupt housing arrangements because a household member has MRSA or VRE.

Once a patient is home, he or she presents little risk to other healthy persons living in the household (11). Efficient discharge of MRSA-positive patients may be a useful measure for decreasing the spread of MRSA in hospitals (2).

Because of its potential for environmental contamination, efforts to control VRE transmission in the home should focus on preventing cross-contamination via the nursing bag, clothing, and equipment which is carried to and from the home by the health care professional. Hands should be washed before leaving the home.

Other persons in the home should be educated about VRE and instructed to clean and disinfect toilet facilities used by the patient and contain and dispose dressings and other disposable materials that may be contaminated No special precautions for linen, dishes, or personal clothing is indicated. If persons in the home provide direct care, they too should be guided on the importance of hand washing, glove use, and other barriers as reasonable and appropriate to the situation. No additional precautions are currently recommended for immunocompromised household members.

INTERIM GUIDELINES FOR PREVENTION AND CONTROL OF STAPHYLOCOCCAL INFECTIONS ASSOCIATED WITH REDUCED SUSCEPTIBILITY TO VANCOMYCIN.

This section summarizes interim guidelines for the control of staphylococcal infections associated with reduced vancomycin susceptibility that were recently published in the Morbidity and Mortality Weekly Report (MMWR) (14).

In many facilities in the U.S., strains of staphylococci (i.e., *Staphylococcus aureus* or coagulase-negative staphylococci) that are resistant to all available antibiotics except vancomycin have appeared. Recently in both Japan and the U.S., infections caused by a strain of *S. aureus* with reduced susceptibility to vancomycin (VISA) have been detected (MIC=8μg/mL) (15,16). The occurrence of fully vancomycin-resistant staphylococcal infections could have serious public health consequences. Therefore it is important for health care facilities to implement the following interim guidelines for preventing the emergence of vancomycin resistance and identifying VISA isolates.

Preventing the emergence of vancomycin resistance

Antimicrobial use is a major risk factor for the emergence of antibiotic-resistant organisms. Reduction of overuse and misuse of antibiotics will decrease the risk of emergence of VISA. Therefore appropriate staff should restrict the use of vancomycin and ensure proper use of other antimicrobials. (See section on decolonization therapy for MRSA and prudent use of vancomycin to prevent VRE.)

Detecting Staphylococci with Reduced Vancomycin Susceptibility

- The most accurate form of antimicrobial susceptibility testing for staphylococci is a minimal inhibitory concentration method (broth dilution, agar dilution, or agar-gradient diffusion) using a 24-hour incubation.
- All strains with a MIC $\geq$4 μg/mL should be considered candidate strains for reduced vancomycin susceptibility. The laboratory needs to ensure that the strain is in pure culture and reconfirm the genus and species or the organism; then repeat the susceptibility test for vancomycin using the minimal inhibatory concentration method.
- After repeat testing, if species identification and susceptibility test results are consistent, immediately contact Office of Epidemiologic Services, Kansas Department of Health and Environment, telephone (785) 296-2951 to report the “presumptive” staphylococcal strain with reduced vancomycin susceptibility.
- Retest staphylococci isolated from patients who fail to respond to vancomycin therapy because resistance may have emerged during treatment.

Obtaining investigational antimicrobials

The susceptibility pattern of a particular staphylococcal strain, the site of infection, and the response to conventional therapy helps determine the need for investigational antimicrobials to treat VISA-related infections. Physicians treating these infections can call the FDA's Division of Anti-Infective Drug Products, telephone (301) 827-2120.

Preventing the Spread of Staphylococci with Reduced Vancomycin Susceptibility

The following steps should be taken whenever a staphylococci with reduced vancomycin susceptibility is detected.

- The laboratory should immediately notify the infection control practitioner, the clinical unit, and the attending physician.
- The infection control practitioners, in collaboration with OES and the CDC, should initiate an epidemiologic and laboratory investigation.
- Medical and nursing staff should:

  - isolate the patient in a private room and use contact precautions (gown, mask, glove, and antibacterial soap for handwashing) as recommended for multidrug resistant organisms. (Appendix B)

  - minimize the number of persons with access to the VISA-positive patient.

  - dedicate specific health care workers to provide one-on-one care for the VISA-positive patient, or the cohort of patients.

- Infection control practitioner should

  - inform all personnel providing direct patient care of the epidemiologic implications of such strains and appropriate infection control precautions.

  - monitor and strictly enforce compliance with contact precautions and other infection control measures.

FOR MORE INFORMATION: call the Office of Epidemiologic Services, Kansas Department of Health and Environment at (785) 296-2951 or Pat Maben in the Adult Care Home Program, Bureau of Adult and Child Care, Kansas Department of Health and Environment (785) 296-1246.

INDICATIONS FOR DECOLONIZATION OF MRSA-COLONIZED PATIENTS AND PRUDENT USE OF VANCOMYCIN TO PREVENT VRE

Who is a candidate for and when to consider decolonization therapy for MRSA

Although treatment of infected patients, residents, and staff are obviously indicated, decolonization of asymptomatic individuals is not routinely recommended. Decolonization therapy is indicated for patients with relapsing MRSA infections. In an outbreak setting, decolonization therapy can be considered for staff who are epidemiologically associated with nosocomial clusters or outbreaks (2). If possible, the facility should subtype the isolates from patients and staff prior to initiating decolonization therapy with staff. Decolonization may also help minimize the frequency of new cases during an outbreak that is ongoing despite intervention. **For most patients, decolonization therapy has not proven efficacious as a major component of MRSA control and encourages the development of more resistant strains.**

Decolonization regimens for MRSA

Numerous antibiotics, used alone or in combination with others, have been used to manage the carrier state with generally poor results. Systemically absorbed oral antibiotics (rifampin in combination with another agent) or the topical mupirocin applied to the site(s) of colonization are the currently favored therapies (2). Simultaneous baths or showers with antistaphylococcal agents such as chlorhexidine have been used. Because drug resistance to orally adminstered antibiotics (rifampin, trimethoprim-sulfamethoxazole, ciprofloxacin, clindamycin) and topical mupirocin has been shown in MRSA isolates of patients who fail or relapse following decolonization therapy, staff must concomitantly monitor for such resistance. Use of vancomycin should be discouraged in these situations (1).

Prudent vancomycin use

Prudent vancomycin use is the most important intervention to reduce the prevalence of VRE (1). Vancomycin use is acceptable for treatment of serious infections caused by beta-lactam resistant gram-positive organisms or for treatment of infections caused by gram-positive microorganisms in patients who have serious allergies to beta-lactam antimicrobials. The report on the recommendations for preventing the spread of vancomycin resistance contains further guidance on the appropriate use of vancomycin (1).

THE ROLE OF THE LABORATORY IN IDENTIFYING AND DETECTING DRUG RESISTANCE MICROORGANISMS

Recommendations for culturing to detect MRSA-colonized or infected patients

Routine culturing of patients or staff for MRSA is not recommended. Patients should be cultured when medically indicated. However to effectively contain spread of the organism during an uncontrolled MRSA outbreak, it may be necessary to culture patients or staff without medical indication. Most MRSA transmission within a facility has been associated with patient-to-patient spread on the hands of staff, and not with the organism colonizing a staff member.

When a facility should culture for MRSA

Routine culturing on all admissions is not warranted. However, hospitals may choose to conduct periodic surveillance or cultures on selected patients for several reasons. For example, hospitals may choose to conduct periodic prevalence cultures, which help detect 20-30% more colonized individuals than cases cultured for clinical reasons alone (17). This practice aides in determining the facility prevalence rate of MRSA colonization or infection. For selected culturing, staff may choose to culture patients admitted from facilities with high endemic rates or patients who were previously known to be positive and who might serve as an out-of-facility reservoir. Identifying clusters in high risk units, such as burn or intensive care, are extremely important, as transmission accelerates when patients in these units are affected.

Culturing of staff is a low-yield activity and is the last of the laboratory strategies recommended. Generally, culturing of staff is necessary only in an outbreak where an epidemiologic investigation has implicated a staff member in transmission. Personnel with infected skin lesions, hand dermatitis, or persistent nasal carriage may be more likely to transmit MRSA.

Culture specimens

Anterior nares cultures will detect most positive patients, and wound cultures in addition to nares cultures, will detect almost all positive individuals. For intense periods of culturing such as during an outbreak investigation or when conducting periodic surveillance, use of selective media will decrease the burden on laboratories. The most accurate test methods for detection of MRSA are shown in the following Table (2).

Strain typing can be extremely useful in determining whether an organism is community or nosocomially acquired. Facilities can contact the microbiology laboratory they routinely use to see whether or not strain typing can be done. If not, contact the Office of Epidemiologic Services, KDHE, 785-296-2951. As there is a rising prevalence of MRSA in communities and health care facilities around the country, the separation of community-acquired versus nosocomially-acquired will help in any epidemiologic investigation of MRSA transmission (18). The most accurate test methods for detecting MRSA are shown in the following table.

Table. Most accurate test methods for detection of MRSA

Method	Medium	Antibiotic	Inoculum	Temperature & Incubation Time	Resistance Values
Disk Diffusion	Mueller-Hinton agar	1 μg oxacillin or 5 μg methicillin disk	$1x10^8$ CFU/ml by swab inoculation	35°C, 24 hours	Oxacillin zone<10 mm Methicillin zone < 9mm
Oxacillin agar screen	4% NaCL supplemented by Mueller-Hinton agar	6μg/ml oxacillin in test medium	$1x10^8$ CFU/ml by direct spot inoculation	35°C, 24 hours	Distinct spot of growth on agar surface
Broth microdilution	2% NaCL supplemented by Mueller-Hinton broth	2-fold dilutions of oxacillin or	$5x10^5$ CFU/ml by direct suspension	35°C, 24 hours	Oxacillin MIC >16μg/ml Methicillin MIC >4μg/ml

Susceptibility tests for MRSA

Susceptibility of MRSA isolates is tested using the minimum inhibitory concentration (MIC). The MIC is the minimal amount of antibiotic needed to inhibit the growth of an organism. MIC differs with each organism and with each antibiotic. The smallest dose of an antibiotic is important for several reasons: 1) preventing drug/toxic side effects; 2) preventing the likelihood of increased resistance; 3) avoiding unnecessary or high costs. Antibiotic dose is usually 2-4 times the MIC. Automated MIC systems are available and many perform as well as manual methods. However, to minimize false negative test results from fully or partially-automated systems, isolates with borderline susceptibility or that are resistant to antimicrobials of many classes can be retested using methods in the above table (2).

When and who to culture for VRE

The following information on VRE was obtained from the Recommendations for Preventing Spread of Vancomycin Resistance (1).

In institutions where there has been no VRE detected, implementing special measures can promote earlier detection of VRE. For hospitals, periodic susceptibility testing can be performed on enterococcal isolates, particularly those from high-risk patients on oncology, ICU, or transplant ward. Hospitals that culture large numbers of specimens may need to test only a fraction (10%) of enterococcal isolates every 1-2 months. Hospitals processing fewer specimens may need to test all enterococcal isolates during the survey period.

In hospitals having many critically ill patients (ICU, oncology, and transplant patients) periodic stool cultures or rectal swabs of such patients can help detect the presence of VRE. Fecal screening of patients is recommended even though VRE may not have been identified clinically because most patients colonized with VRE have intestinal colonization.

The size of the high-risk patient population and involved hospital units should determine the frequency and intensity of surveillance. Screening costs can be reduced by inoculating specimens onto selective media containing vancomycin and restricting screening to patients who

have been in the hospital long enough to have a substantial risk for colonization (5-7 days) or who have been admitted from a facility where VRE have been identified.

When colonization with VRE has been detected in a hospital, all enterococcal isolates (including those from urine and wound) should be screened routinely for vancomycin resistance. Efforts to contain the spread of VRE, such as handwashing and compliance with other isolation precaution measures should be intensified.

Identification of Enterococci

For epidemiologic purposes, the species level (e.g., *Enterococcus faecium* or *Enterococcus faecalis*) should be determined. Additional tests are necessary to distinguish *Enterococcus gallinarum* and *Enterococcus casseliflavus* from E. *faecium*.

Susceptibility tests for VRE

Determine resistance to vancomycin and high-level resistance to penicillin and aminoglycosides for enterococci isolated from blood and sterile body sites, or from other sites as clinically indicated.

Reporting MRSA- or VRE-positive isolates

Notify the patient's or resident's primary care giver, patient-care personnel, and infection control personnel. For specimens where VRE is suspected, this can be done while confirmatory testing is being conducted. Highlight the report on the isolate to alert staff that isolation precautions are indicated. Sporadic MRSA or VRE infections are not reportable to the Kansas Department of Health and Environment. However, outbreaks caused by these organisms are reportable by calling the Office of Epidemiologic Services, Kansas Department of Health and Environment, 785-296-2951.

IDENTIFYING AND CONTROLLING MRSA- OR VRE-RELATED OUTBREAKS

Current Kansas regulations do not require reporting of single cases of MRSA or VRE infections. **However, outbreaks associated with these organisms should be reported as soon as possible to the Office of Epidemiologic Services (785) 296-2951.**

Monitor baseline levels

Devlop a case linelisting to monitor MRSA or VRE infections. The information should include date of admission (if applicable); demographic information (such as age and gender); site(s) of colonization or infection; date and site of first positive culture for MRSA or VRE; room number or nursing unit; the name of the transferring facility if applicable; and the antimicrobial susceptibility of the isolate.

The institution's infection control practitioner (ICP) should divide MRSA or VRE isolates into community-acquired or nosocomially-acquired. Nosocomially-acquired are those infections in which there was no evidence that the infection was present or incubating at the time of the most recent admission to the institution. A common definition for nosocomial infections is infections that are acquired more than 48 hours (2 days) after admission, but other defintions have been used (19,20). Such classification is not always straightforward, however, and infection control practitioners may need to further define what is nosocomially-acquired. For instance, nosocomial infection may go undetected or become evident only after discharge, thus the issue of how to classify individuals who were previously hospitalized or resided in a long term care facility and are colonized or infected at admission is unclear. Newborn infections that are the result of passage through the birth canal are also considered nosomially acquired. Transplacentally-acquired infections are not considered nosocomial.

Confirm the diagnosis if positive cultures are coming from small laboratories, doctors offices, or if your hospital laboratory is seeing its first MRSA or VRE case.

Identifying an outbreak

1. Case definition

A case is a patient who has nosocomially-acquired infection/colonization with MRSA or VRE.

2. When to suspect an outbreak

a. In a facility or unit which has never had MRSA or VRE: 2 or more cases within a month.

b. In a facility or unit which has sporadic community-acquired MRSA/VRE infections or sporadic nosocomially-acquired MRSA/VRE: any serious deviation from baseline, such as 2 or more cases on a unit or 3 or more epidemiologically-associated MRSA/VRE cases (e.g., shared same caregiver, shared same activities, or had same type of surgery).

3. Control measures

a. The ICP should make physicians, adminstration, and other staff aware of the outbreak. If physicians are aware of increased cases they may want to culture symptomatic patients more frequently for treatment purposes.

b. Provide a handwashing inservice to direct patient care providers on all shifts.

c. Have the laboratory save isolates for possible PFGE analysis by the State laboratory.

d. Take certain precautions for MRSA/VRE patients.

Immediately after identification of the MRSA/VRE isolate, the ICP or other designated individual should place the patient into isolation as defined below. The ICP should evaluate each case individually for the possibility of cross-contamination during routine care. Once the ICP determines that transmission is no longer a major threat, e.g., a patient with MRSA endocarditis whose only treatment is IV antibiotics, he/she should have the authority to cancel the isolation order.

In MRSA- or VRE-related outbreaks use contact precautions (see Appendix B) for colonized or infected patients. Droplet precautions (see Appendix B) should be used for respiratory infections.

Identifying the end of an outbreak

1. The outbreak may be considered under control when there are no new cases within a month.

2. When the outbreak is over, be sure to notify the units, physicians, and laboratory with a reminder not to let down their positive, new habits to prevent disease transmission.

If an outbreak continues

If an outbreak does not come under control *within one month of identification*, then more strigent methods may be necessary.

1. Be sure the handwashing agent used throughout the affected areas is an antimicrobial agent, effective against the involved organism.

2. Cohort patients and employees especially in critical care units or other high-risk areas. Unaffected patients or residents should not be admitted to the cohort area, and the designated staff caring for the affected patients or residents should not care for unaffected individuals.

3. Culture open wounds of patients in the affected areas and new admissions from high-risk settings (e.g., LTC facilities, hospitals with MRSA).

4. Encourage administration to provide adequate staff-to-patient ratios.

5. Alert the antibiotic utilization committee of the increase in MRSA or VRE. MRSA has been found to colonize/infect individuals for whom antibiotic therapy lasts more than 14

days or who received repeated antibiotic therapy within a 30-day period. Overuse of broad spectrum antibiotics, widespread use of penicillinase-resistant antibiotics, and low dose antibiotic therapy also present higher-risk situations (2). Vancomycin use has consistently been shown to be a risk factor for infection or colonization with VRE, and may also increase the possiblity of development of vancomycin resistant Staphylococcus aureus (VRSA) or Staphylococcal epidermis (VRSE) (1).

7. For VRE-associated outbreaks, epidemiologic investigations may suggest an environmental role in transmission. In these instances, institutes experiencing ongoing transmission of VRE should verify that the facitlity has adequate procedures for routine care, cleaning, and disinfection of environmental surfaces (e.g., bed rails, bedside commodes, carts, door knobs, charts, and faucet handles.) The investigation team may want to take environmental cultures before and after cleaning to assure that housekeeping staff are adequately cleaning or disinfecting environmental surfaces. Except for unusual circumstances, such as in burn units, environmental culturing is not recognized as a control measure in MRSA-related outbreaks.

8. Discuss the situation with the Office of Epidemiologic Services, Kansas Department of Health and Environment (785) 296-2951 for advice. They may suggest a case-control study to determine if one or more employees/physicians are epidemiologically associated with the outbreak.

DEFINITIONS

MRSA or VRE Colonization: When an individual is colonized, the organisms are present but there is no evidence of tissue destruction, fever, etc. Individuals do not need to be hospitalized simply because they are colonized.

MRSA or VRE Infection: Infection is clinically noted by fever, elevated white blood cell counts, and evidence of wound separation and/or tissue destruction. Clinical evidence of infection may be altered in immunocompromised individuals.

Carriage: Carriage means the same thing as colonization. Individuals may habor microorganisms for a short period of time (transient), intermittently, or persistently.

Cohorting: Two or more persons who are culture positive for MRSA or VRE who are separated physically (assigned to a separate room or ward) from other residents or patients who are not colonized or infected with the microorganisms. In hospital settings, staff are also usually cohorted (i.e., staff members are assigned to care for cohorted patients and do not take care of other patients).

Endemic: The microorganism is constantly detected in a facility by ongoing surveillance. Endemic implies there is a constant introduction of the organism from the community or from other health care facilities in the community. The level of endemicity is not the same in all facilities.

Nosocomially-acquired: The individual is infected or colonized with an organism while in the hospital or long term care facility. The definition of "nosocmially-acquired" varies, but a common definition is an infection that is acquired in the facility more than 48 hours (2 days) after admission.

Outbreak: A definite increase over the baseline level in the frequency with which MRSA or VRE are detected. In facilities where these organisms have not been detected, or have rarely been detected, an outbreak may consist of two cases occurring within a relatively short period of time (e.g., a month). In facilities where these organisms are more common, an outbreak would represent a larger number of cases.

Virulent: In infectious disease epidemiology, the virulence of an organism is its capability of causing severe disease - the more virulent the organism, the more severe the disease.

Standard Precautions: Standard precautions incorporate *universal precautions* (UP) and *body substance isolation* (BSI). (See Appendix B) UP were designed to reduce transmission of blood borne pathogens while BSI measures were designed to reduce the risk of transmission from moist body substances. Standard precautions assume that all patients are infectious, and apply to blood, all body fluids, secretions, excretions (except sweat), nonintact skin, and mucous membranes, whether or not blood is visible. The procedures call for: 1) **hand washing** between patient contact, 2) **gloves** when touching blood, body fluids, excretions, secretions or contaminated items, 3) **mask, eye protection, gowns** if the patient care activity may result in splashes or sprays

of blood or secretions/excretions, 4) **careful handling of patient equipment and linen to reduce transmission and environmental contamination**, 5) **avoiding exposure to needles and sharps**, and 6) use of **mouthpieces and resuscitation bags** when necessary.

Transmission-based Precautions: Transmission-based precautions were designed for patients who are or are suspected of being infected with a highly transmissible or epidemiologically important agent. These precautions are to be used in addition to standard precautions. There are three types of transmission-based precautions (See Appendix B): 1) airborne precautions, 2) droplet precautions, and 3) contact precautions. *Airborne precautions* are designed to reduce the risk of transmission of airborne droplet nuclei (5 μm or smaller) of evaporated droplets that can remain suspended in the air for a long period of time or dust particles which contain the infectious agent. *Droplet precautions* are designed to reduce transmission by contact with large-particle droplets (larger than 5μm in size) containing infectious agents which come into contact with conjunctivae or the mucous membranes of the nose or mouth. Droplets are usually generated during coughing, sneezing, talking, or during procedures such as suctioning and bronchoscopy. Droplet transmission requires close contact as the particles do not stay suspended for long. *Contact precautions* are designed to reduce the risk of transmission by direct and indirect contact. Direct-contact transmission involves physical transfer of the microorganisms by skin-to-skin contact such as when personnel turn or bathe patients. Indirect-contact transmission involves contact of a susceptible host with a contaminated intermediate object (usually inanimate), such as a contaminted bed rail. Indirect-contact transmission is probably more important in the transmission of VRE than MRSA.

These precautions apply not only to VRE and MRSA but other antibiotic resistant organisms (i.e., Klebsiella, Pseudomonas, or E. Coli).

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APPENDIX A

MRSA FACT SHEET

VRE FACT SHEET

CONTROL OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) IN HEALTH CARE SETTINGS

MRSA is a prevalent nosocomial pathogen. The most important reservoir is colonized or infected patients or residents. While health care personnel can serve as reservoirs for MRSA, they are often transiently colonized, and serve as a transmission link between patients. The main mode of transmission for MRSA is by the hands of health care workers which can become contaminated by contact with 1) infected or colonized patients, 2) colonized or infected body sites of the health care workers themselves, or 3) contaminated devices, items, or environmental surfaces.

For most instances, standard precautions should control the spread of MRSA.

Standard precautions include:

1) Handwashing

Wash hands after touching body fluids, blood, secretions, excretions, and contaminated items, whether or not gloves are worn. Wash hands immediately after gloves are removed, between patient contacts, and when otherwise indicated to avoid transfer of microorganisms to other patients or environments. It may be necessary to wash hands between tasks and procedures on the same patients to prevent cross-contamination of different body sites.

2) Gloving

Wear gloves (clean nonsterile gloves are adequate) when touching blood, body fluids, secretions, excretions, and contaminated items. Put on clean gloves just before touching mucous membranes and nonintact skin. Remove gloves promptly after use, before touching noncontaminated items and environmental surfaces, and before going to another patient, and wash hands immediately to avoid transfer of microorganisms to other patients or environments.

3) Face protection (mask and eye protection)

Wear a mask and eye protection or a face shield to protect mucous membranes of the eyes, nose, and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.

4) Gowning

Wear a gown (clean nonsterile gown is adequate) to protect skin and prevent soiling of clothes during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions or cause soiling of clothing.

5) Appropriate device handling

Handle used patient-care equipment soiled with blood, body fluids, secretions and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of microorganisms to other patients and environments. Ensure that reuseable equipment is not used for the care of another patient until it has been appropriately cleaned and reprocessed and single use items are properly discarded.

6) Appropriate handling of laundry

Handle, transport, and process used linen soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and avoids transfer of microorganisms to other patients and environments.

Certain conditions or situations require additional precautions. If a facility's infection control program has determined that MRSA is of special clinical or epidemiologic significance, then contact precautions should be considered. In addition to contact precautions, droplet precautions should be considered for patients with MRSA pneumonia.

Contact precautions consist of:

1) Placing a patient with MRSA in a private room. When a private room is not available, place the patient in a room with patient(s) who have active infections with MRSA.

2) Wearing gloves (clean nonsterile are adequate) when entering the room. During the course of providing care for the patient, change gloves after having contact with infective material that may contain high concentrations of microorganisms (fecal material and wound drainage). Remove gloves before leaving the patient's room and wash hands immediately with an antimicrobial agent. After glove removal and handwashing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of microorganisms to other patients.

3) Wearing a gown when entering the room if you anticipate that your clothing will have substantial contact with the patient, environment surfaces, or items in the patients room, or if the patient is incontinent, or has diarrhea, an ileostomy, a colostomy, or wound drainage not contained by a dressing. Remove the gown before leaving the patient's room. After gown removal, ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients or environments.

4) Limiting the movement and transport of patient from the room to essential purposes only. If the patient is transported out of the room, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces or equipment.

5) Ensuring that patient-care items, bedside equipment, and frequently touched surfaces receive daily cleaning.

6) When possible, dedicating the use of non-critical patient-care equipment and items such as stethoscope, sphygmomanometer, bedside commode, or electronic rectal thermometer to a single patient (or cohort of patients infected or colonized with the pathogen requiring precaution) to avoid sharing between patients. If use of common equipment or items is unavoidable, then adequately clean and disinfect them before use with another patient.

Droplet precautions consist of:

1) Appropriate patient placement as in Contact Precautions #1.

2) Masking - In addition to other precautions, wear a mask when working within 3 feet of the patient. (Some facilities may want to implement the wearing of masks when entering the room.)

Adapted from the Center for Disease Control and Prevention's Hospital Infections Program, January 21, 1997.

Office of Epidemiologic Services, Kansas Department of Health and Environment, 900 SW Jackson, Room 1051 S, Topeka, KS 66612-1290, 785-296-2951. Revised 3/98.

PREVENTING THE SPREAD OF VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)

The "Recommendations for Prevention of Spread of Vancomycin Resistance" were published in Infection Control and Hospital Epidemiology 1995;16:105-113 and the MMWR 1995;44 (RR-12). Reprints are available from the National Technical Information Service, telephone (703) 487-7650.

These recommendations apply only to acute-care hospitals, and not to long term care or outpatient facilities. Each hospital, in consultation with the Kansas Department of Health and Environment, should develop a plan regarding discharge of VRE-infected or colonized patients to nursing homes and other facilities.

The current recommendations are based on the limited available data regarding the epidemiology of VRE. As new data become available, some of the recommendations may be revised.

The major recommendations to prevent the emergence and transmission of VRE are:

1. Prudent vancomycin use.
2. Education program for hospital personnel on VRE transmission and control.
3. Routine testing of all enterococci isolated from the blood and sterile body sites (except urine) for vancomycin resistance.
4. Screening of all enterococcal isolates for vancomycin resistance, if VRE are detected.
5. Appropriate use of isolation precautions for all VRE-infected or colonized patients.

The optimal time to discontinue isolation precautions for patients with VRE is unknown. As VRE colonization may persist for long periods, stringent criteria are recommended. For example, some institutions continue precautions until they achieve VRE-negative results on 3 consecutive occasions, one or more weeks apart, for all cultures from multiple body sites.

There is no evidence that VRE are more resistant to routinely used hospital disinfectants than are vancomycin-susceptible enterococci. It is important to ensure, however, that routine procedures for cleaning and disinfection of medical devices and environmental surfaces are followed carefully.

VANCOMYCIN-RESISTANT *STAPHYLOCOCCUS AUREUS*

The Office of Epidemiologic Services, Kansas Department of Health and Environment, 785-296-2951, should be informed of the isolation of vancomycin-resistant *Staphylococcus aureus*.

Adapted from the Center for Disease Control and Prevention's Hospital Infections Program, January 21, 1997. Office of Epidemiologic Services, Kansas Department of Health and Environment, 900 SW Jackson, Room 1051 S, Topeka, KS 66612-1290, 785-296-2951. Revised 3/98.

APPENDIX B

GUIDELINES FOR ISOLATION PRECAUTIONS IN HOSPITALS

Garner JS and the Hospital Infection Control Practices Advisory Committee

Infection Control and Hospital Epidemiology. 1996;17:53-79